AN ANALYSIS OF CAREER PROGRESSION RATES OF CIVILIAN GRADUATES OF THE AIR FORCE INSTITUTE OF TECHNOLOGY

THESIS

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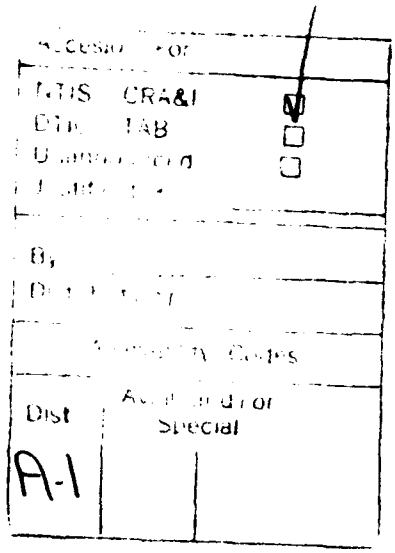

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AFIT/GLM/LAR/93S-25

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THESIS

Presented to the Faculty of the School of Logistics
and Acquisition Management
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Logistics Management

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Helena R. Hughley

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Abstract

This study analyzes the career progression rates of civilian graduates from the School of Logistics and Acquisition Management of the Air Force Institute of Technology (AFIT). The sample includes all civilian AFIT graduates who are currently working for the Air Force Materiel Command (AFMC). Actual promotion rates of the AFIT graduates are compared to promotion rates for two comparison groups: AFMC civilians with a master's degree from a civilian institution; and AFMC civilians with a bachelor's degree but no graduate degree. A regression analysis is performed to study the relationship between specific factors and a graduate's future rate of promotion.

The results of this analysis show that civilian AFIT graduates have promotion rates that are significantly higher than either civilian comparison group. The AFIT graduate has a higher rate of promotion than a civilian with a non-AFIT master's degree of about one-half grade, on average. It was also found that the grade point average obtained while attending AFIT is significantly related to the future rate of promotion. Other results show that being a female is negatively related to rate of promotion except for the AFIT graduate female, where the relationship is positive.

AN ANALYSIS OF CAREER PROGRESSION RATES OF CIVILIAN GRADUATES OF THE AIR FORCE INSTITUTE OF TECHNOLOGY

I. Introduction

Background

A leaner organizational structure resulting from reduced defense budgets requires the Air Force to enhance existing work-force capabilities. One way to enhance work-force performance is to implement effective educational programs. The graduate degree programs in the School of Logistics and Acquisition Management (formerly the School of Systems and Logistics) at the Air Force Institute of Technology (AFIT) are designed to provide Air Force civilians and officers with the knowledge and analytical tools needed to manage the cultural and technological challenges of the Defense environment (1:1). The School of Logistics and Acquisition Management is responsible for the following Master of Science degree programs: Logistics Management, Systems Management, Software Systems Management, Information Resource Management, Contracting Management, and Cost Analysis. The Information Resource Management and Software Systems Management programs are 18-month programs which have been recently added; the remaining programs are 15-month programs. The Logistics Management program has four options: Acquisition Logistics Management, Logistics Management, Maintenance Management, and Supply Management.

Civilians compete for openings in the full-time graduate programs at AFIT by preparing nomination packages, which are submitted to the Air Force Civilian Personnel Management Center (AFCPMC) at Randolph Air Force Base, Texas. AFCPMC reviews each package and recommends to AFIT a list of employees for long-term, full-time training. The recommended employees who satisfy AFIT's admission requirements are notified in writing of their selection for a particular full-time AFIT graduate program.

The civilians in full-time AFIT programs represent a substantial investment for the Air Force. The Air Force not only provides each civilian student with a full-time salary for 15 or 18 months, but also reimburses him or her (up to a predetermined dollar amount) for the cost of textbooks and certain course materials. In addition, civilian students from outside of the local Dayton, Ohio area are provided a 55% temporary duty (TDY) per diem.

Problem Statement

The Management Question for this thesis is, "Does the Air Force benefit from allowing civilians to participate in long-term, full-time programs within the Graduate School of Logistics and Acquisition Management at the Air Force Institute of Technology (AFIT)?" AFIT degree programs are specifically designed to meet future needs of the Air Force, whereas degree programs from civilian institutions generally are not. Indirectly, evidence of such benefits of

specialized higher education may be implied by higher rates of career progression of AFIT master's degree graduates compared to civilian employees without a master's degree or with a master's degree from other institutions. This thesis investigates career promotion rates for these three groups.

Scope

This thesis will focus on civilian AFIT graduates of the School of Logistics and Acquisition Management. The career progression results are based on data collected on Air Force Materiel Command (AFMC) employees. The data are extracted from a personnel database.

In a previous study of AFIT civilian graduates, future research was recommended to determine "whether graduates of AFIT's Graduate Management Programs were being promoted faster, slower, or at the same rate" as other civilian employees (19:84). The present study should be useful to the Air Force, especially the AFIT administration, in helping to determine if the AFIT civilian population should be expanded. Also, it should be useful to the Air Force Civilian Personnel Management Center in determining if the Air Force is actually benefitting from civilian participation in AFIT Graduate Management Programs.

Chapter II of this thesis provides a literature review of studies conducted to determine what criteria is used to measure the effectiveness of education and management training. It also provides a literature review of private

and public sector studies conducted to determine the effects of graduate education on career advancement and job performance. Chapter III describes the samples used in this study, explains the methods used for data collection, and provides descriptive statistics for each of the samples. Chapter IV discusses the results of the analyses conducted on the samples, and Chapter V provides our conclusions from the study and recommendations for future research.

II. Literature Review

Introduction

This chapter, after a general discussion of the evaluation of education and management training programs, reviews the literature in two major areas related to this thesis. The first area is that of former studies of AFIT graduates that pertain to career progression. The second area is that of education in relation to career progression.

Evaluation of Education and Management Training

In order to investigate the returns of educational and management training programs, a seven-page questionnaire was sent by A. P. Sullivan for his 1970 dissertation to 50 random Fortune-500 industrial corporations to obtain information on the status of their management training programs. When asked to rank the order of importance of effectiveness indicators that they actually relied on in practice when evaluating a given management training program, the most frequently cited criteria were: 1) change in performance on the job; 2) reaction of students to training; and 3) changes in knowledge, skills, or attitudes possessed by the students. When asked which reason for management training evaluation was regarded as most important, the principal reason given for evaluation was to determine if there was a payoff from such programs (7:65-69).

Donald Kirkpatrick's 1975 article "Evaluating Training Programs" in Training and Development is considered a classic in regard to the effects of training (11:53). Four levels of training evaluation are delineated by Kirkpatrick: reaction (How did you like the training?); learning (What do you know now that you didn't before?); behavior (What do you do differently?); and results (How did the training affect your organization?). The four major areas in measuring the effect of training and education by Hall in "Trends in Education" are basically the same, though he refers to them by different names: reaction of participants, knowledge gained, application of new knowledge and skills on the job, and impact on the business. Hall states that knowing whether participants liked a program, what they learned in it, and how they are using the new knowledge and skill on the job provides a rich body of information about the quality of education and training programs. However, it does not answer the most important question: Did the program improve the bottom line? (9:19)

Hallett in "Training and Education: The Competitive Edge" also emphasizes that the bottom line of training and education is to focus on outcomes as the goal. He states that there is a better chance of delivering what is needed, when it is needed "to the degree that we can associate training and education with performance - that is with results" (10:32). In the article, "Management Training: Justify Costs or Say Goodbye," it was recommended that

subjective evaluations by participants (internal criteria) be combined with measures assessing behavioral change on the job (external criteria) in order to evaluate fully the effectiveness of management training programs. The measures which they chose to use for the external criteria in their research were "subsequent attrition and career progressions of participants" (20:68).

Previous Studies of AFIT Graduates

AFIT History. AFIT was established in 1919 as the Air School of Application. It was located at McCook Field in Dayton, Ohio. The school was renamed the Air Corps Engineering School in 1926 and moved to Wright Field in 1927. Classes were suspended shortly after the attack on Pearl Harbor and the school reopened in 1944 as the Army Air Forces Engineering School. In 1946, AFIT was known as the Army Air Force Institute of Technology. After the Air Force became a separate service in 1947, AFIT was renamed the Air Force Institute of Technology.

The School of Logistics became a permanent part of AFIT in 1955. In 1963, the School of Logistics was renamed the School of Systems and Logistics. Until 1992, the School of Systems and Logistics conducted both graduate programs and professional continuing education courses. In 1992, the graduate programs were organized under the School of Logistics and Acquisition Management (1:1-2).

Graduate Education and Career Advancement. Career advancement for civilian Air Force employees can be defined in terms of the number of promotions or increased grade levels. One of the determinants of career advancement is job performance. AFIT's School of Logistics and Acquisition Management graduate degree programs were designed to provide students "with the opportunity to acquire and apply a variety of analytical, quantitative, behavioral, and decision-making concepts and techniques to the management of complex systems" (2:2). In a 1986 study done by Theis, surveys were sent to former civilian graduates of AFIT's School of Systems and Logistics graduate degree programs and their immediate supervisors. Survey results indicated AFIT graduates were perceived as being better prepared for positions of greater responsibility than those who had not attended the school's programs (19:76). Of the graduates surveyed, pay grades upon entering AFIT ranged from GS-5 to GS/GM-13.

> The lowest current grade was a GS-12 and the highest was in the GS-16-18/Senior Executive Service (SES) level, indicating progress towards positions of greater responsibility. However, a direct attribution to the AFIT program alone could not be made from the information provided. (19:30,77)

A 1972 study by Chamberlin and Smith compared the managerial performance of officers with masters degrees in business from civilian institutions to the managerial performance of officers holding degrees from the Graduate

Logistics Management program at AFIT. Performance data prior to graduate schooling was collected from Officer Effectiveness Report (OER) scores to determine if the groups were significantly different prior to further education. Performance data after graduate schooling was collected by sending performance evaluation instruments to each officer's immediate supervisor. "The results of the comparisons prior to the attainment of an advanced degree showed no significant differences in the OER means between the two groups" (6:31). However, an analysis of the performance evaluation instruments indicated "officers who have graduated from the Graduate Logistics Management Program performed significantly better than those who have obtained their Masters degrees from civilian schools" (6:62).

"It is assumed that individuals with a master's degree generally perform better in a managerial position than do those with a bachelor's degree" (3:1). Using the same methodology described in the preceding paragraph, the Chamberlin and Smith study also compared the job performance of officers with master's degrees in business from civilian schools to the job performance of officers without master's degrees. They concluded that "officers without Masters degrees performed their managerial jobs significantly better than those possessing Masters degrees from civilian schools" (6:62).

Several studies have been done to determine if graduate school grade point averages (GPA) or graduate admission test scores (i.e., scores from the Graduate Management Admissions Test) have a significant effect on graduates' career performance (promotion rates) or compensation. Zwart conducted a study to determine if the Air Force receives a lower return on its investment from officers who graduate from AFIT with "marginal grade point averages," which were operationally defined as GPAs less than 3.20 (22:4). Career performance was analyzed using the following variables: time to promotion, selection rate for promotion, and service time in the Air Force.

> Based on the career performance measures used in this study, the Air Force appears to be receiving an equal return on its investment from both the marginal and non-marginal graduates. No significant differences between marginal and non-marginal scholastic performers could be found in promotion time or service time; however, the selection rate to lieutenant colonel for marginal graduates was lower than the selection rate for the rest of the AFIT graduates. (22:44)

A study was just completed in September 1992 by Beres and Camacho, which analyzed the retention rates of Air Force officers graduating from AFIT between 1973 and 1987. Because of the Air Force's "up or out" promotion policy, one would expect increased retention to reflect increased promotion. By comparing actual and expected retention rates, Beres and Camacho found that the retention rates for the AFIT Air Force officer graduates were significantly

higher than those of otherwise similar Air Force officers. Results of their analysis also showed that age at graduation, grade point average, and in some cases, sex and aeronautical rating were significant factors influencing retention (5:59).

Education in Relation to Career Progression

Education and Earnings. Since enhanced career progression for civilians in the Air Force typically goes hand in hand with higher earnings, we found much relevant literature in regard to the relationship between education and earnings. The bottom line of this research is that "In a changing world, few things are as certain as that people with more education earn more money" (12:25). A report by R. Kominski (1990) presented information on education and earnings from the Bureau of the Census' Survey of Income and Program Participation for the population existing in the spring of 1987. Education was separated into the following nine levels: Not a High School Graduate; High School Graduate; Some College; Vocational School; Associate's Degree; Bachelor's Degree; Master's Degree; Professional Degree; and Doctorate Degree. As educational level increased, average monthly earnings increased, with the only exception being that the person with a professional degree earned slightly more than the person with a doctorate ($4000 versus $3700). The report found that "Most degrees beyond high school have significantly higher income and earnings

associated with them than the next lower degree (except for the contrast of Ph.D. and professional degrees)" (12:25).

Traffic Management magazine's 1988 salary survey of 2000 readers also found that "Education does pay. That's one of the clearest conclusions from our fifth annual salary survey" (16:34). They found average salaries by education for professionals working in traffic, transportation, and distribution were as follows:

High School only	$36,746
Some College	$38,796
B.S./B.A. Degree	$46,771
Graduate Degree	$48,420
M.B.A. Degree	$60,939

A study by M. Kosters (1990) looked at wage rates by schooling and work experience categories derived from Current Population Survey information for a 15-year period ending in 1988. He found that during the eighties, wage premiums rose across the entire spectrum of schooling levels and the percentage wage gap between schooling levels widened between all schooling levels (13:309).

Education and Promotion Prospects. One area of the literature pertains to the influence educational attainment has on a person's rate of advancement. S. Spilerman and T. Lunde (1991) looked at the data from a large insurance company, which employed approximately 16,000 employees. Data for six salary level groupings from a sample of

employees who entered employment between 1971 and 1978 was reviewed in connection to years of schooling, earned degrees, quality of school, and college major. They found a strong tendency for promotion to be associated with years of schooling and that the returns for years of schooling are consistent with results reported by others (17:702).

When looking at returns for educational attainment by organizational rank, they found that returns for years of schooling are small in the lowest and the highest ranks and peak in the middle ranks. The explanation is that in the lowest ranks, promotions are largely scheduled and require little more than acceptable attendance and the meeting of minimum performance standards. In the highest ranks, it is leadership style, personality, and political alliances - rather than educational attainment - that determine advancement (17:704).

In regard to credentials, Spilerman and Lunde found that a master's degree increased one's promotion prospects independent of employment duration as well as increased the rate of promotion in the higher salary grades, where the skills associated with the degree can enhance work performance. They state that this "conforms to a formulation in which employers reward educational attainment that is consistent with work requirements in a particular rank" (17:711). In regard to college quality, they state that:

> findings suggest that college selectivity is used as a 'quality signal' by employers in regard to the expected performance of recent hires (Pfeffer 1981, p.352). The quality signal is utilized in initial promotion decisions, in the middle organizational rank, where college training would provide relevant job skills. (17:711)

Spilerman and Lunde conclude that:

> the principal finding from this analysis is that employers reward schooling to the extent it is relevant to job performance; as a result, the particular educational features that predict to advancement vary with salary grade. . . . The greatest impact of education occurs at the point at which supplementary schooling is likely to convey job relevant skills. (17:715)

Ariss and Timmins conducted a study to determine if there were differences in the managerial performance of employees with master's degrees compared to those who held bachelor's degrees. The study was conducted on city employees of a medium-sized city in the midwest. Their findings indicated there were no significant differences in work performance between holders of master's degrees and bachelor's degrees in non-technical positions.

> Although managers who hold master's degrees are sometimes given higher managerial positions and more authority and responsibility on the job, the holders of a bachelor's degree were perceived by their managers to perform as well as the holders of a master's degree while performing the same level job. (3:6)

A study conducted by research psychologists at AT&T (Hall, 1985) and reported by Ariss and Timmins in Public Personnel Management (3:3) also showed employees with

master's degrees performed no better than those with bachelor's degrees:

> Masters degree holders generally brought to the organization greater administrative and interpersonal skills and more motivation for money and status, but apparently not any more intellectual ability and performance than bachelor degree holders. (3:3)

Pfeffer conducted a study of master's of business administration (MBA) and bachelor's degree graduates from a large university to determine if several variables, including GPAs and admission test scores, were determinants of career success. Each subject was surveyed and asked to provide starting and current salaries, in addition to other information. GPAs and admission test scores were accessed from student files. "There was no evidence that either grades or test scores significantly predicted either starting or current compensation for MBA graduates" (15:701).

In addition to job performance, other determinants of career advancement include ability, related work experience, and mentor influence. Mentors are defined as "individuals who develop an intense professional relationship with one or more individuals at lower levels of the organization" (18:546). Results from a survey of MBA graduates from the Universities of Kansas, Missouri, and Oklahoma showed "mentoring was related to both promotion rate and total compensation. Other variables significantly related to

promotion rate included work experience and continuous work history" (21:341).

Education and Male-Female Wage Gap. In regard to the differences in the earnings of men and women, Kominski's study of education and earnings in 1987 showed that "the differences. . . at each degree level are substantial" (15:25). He attributes a major reason for this to notable differences between the sexes with respect to career fields. Men hold a proportionately higher number of degrees in higher paid fields such as economics, engineering, and mathematics and statistics, whereas women have proportionately higher numbers of degrees in lower paid fields such as home economics, education, and English. Daymont and Andrisiani (1984) also found differences between men and women in college major significantly contributed to an earnings gap (10:418).

Traffic Management magazine's survey found that "where salaries are concerned, the gender gap is as wide as ever" (19:39). They found that a college-educated female earned $33,547 as compared to $48,075 for a college-educated male, with female MBA's averaging about $14,000 a year less than male MBA's. Even with the same amount of experience (15-20 years), women averaged $34,618 to over $46,000 for men.

Summary

Based on the research described in this literature review, it is apparent that increased education leads to increased earnings and increased job promotion prospects, although more so for men than for women. Therefore, we hypothesized that former AFIT graduates have an enhanced rate of promotion, but to a degree which is greater for males than for females.

There are differences of opinion in the literature regarding the influence of grade point average (GPA) on future performance. Also, there is a question as to whether any differences on future performance exist between the bachelor's and master's degree graduates of civilian institutions. Thus we hypothesized that there are no significant differences on future career progression based upon GPA or between the Non-AFIT Masters and the Bachelors groups.

Having reviewed the literature pertaining to this thesis, the next chapter will provide a description of the total Air Force civilian AFIT graduates from the School of Logistics and Acquisition Management over the past 25 years, as well as a description of the three sample groups whose rates of promotion are analyzed in this study.

III. Method and Data

Research Design

The primary method used in this study was statistical analysis of the rate of career progression for civilians with a master's degree from AFIT, civilians with a master's degree from a civilian institution, and civilians with only a bachelor's degree. Higher rates of career progression may indicate that a particular group of graduates performs better in the workplace. Our primary investigative question is: Do civilians with a master's degree from AFIT tend to achieve a higher rate of career progression?

Description of Population and Samples

AFIT Graduates. There have been 246 Air Force civilian AFIT graduates of the School of Logistics and Acquisition Management (formerly Systems and Logistics) for the past 25 years (1968-92). Our sample consisted of those 141 civilian AFIT graduates who were currently working for the Air Force Materiel Command (AFMC). The reason for this is that over 80 percent of all Air Force civilians work for AFMC and the data were readily available at HQ AFMC, Wright-Patterson Air Force Base, Ohio.

Comparison Groups. Two random samples were drawn from the population of current civilians in professional and administrative career fields in AFMC. The first sample consisted of a random sample of 300 current civilian

employees with either a bachelor's degree or some graduate work, but less than a master's degree. This group was used as a comparison group for purposes of comparing civil service grade levels with those of AFIT graduates. The second sample consisted of another random sample of 300 current civilians with master's degrees from institutions other than AFIT. Their rates of promotion since obtaining their master's degrees were compared with those of AFIT graduates. The random samples were obtained from a sampling program utilized by HQ AFMC.

Data Collection

Civilian AFIT Graduates. Data for the civilian AFIT graduates were collected from two sources. Data for all Air Force civilian AFIT graduates from the School of Logistics and Acquisition Management from 1968-92 was obtained from the AFIT Office of the Registrar in a two-step process. First, the names of the civilian AFIT graduates for the 25-year period were identified from quarterly folders containing Faculty Board of AFIT letters specifying the names of those AFIT students being awarded a degree for that particular quarter.

Secondly, the file folders for all identified civilian graduates were examined. During this stage all non-Air Force civilian AFIT graduates, such as civilians from other services, the Department of Defense, the Defense Logistics Agency, et cetera, were deleted. The data that were

collected included information pertaining to age, sex, GS or GM grade at time of graduation, major command prior to AFIT, area of academic concentration prior to AFIT, area of specialized study at AFIT, year graduated, overall grade point average at AFIT, and Social Security Number (SSN). Due to the Privacy Act, the names and SSNs of all students were kept in the strictest confidence and were known only to the thesis team and primary advisor.

A second source of information was obtained for the 141 civilian AFIT graduates from the School of Logistics and Acquisition Management currently working for AFMC. These data were obtained from the HQ AFMC Civilian Personnel System database. The names and SSNs of the graduates included in this database were not provided. To cross reference those civilian AFIT graduates currently working for AFMC with those from the 25-year population of Air Force civilian AFIT graduates obtained from the AFIT Registrar's records, a control number consisting of the second, fifth, seventh, eighth, and ninth digits of the individual's SSN was used. The AFMC database supplemented data provided by the Registrar's Office and included the individual's current GS or GM grade and the individual's service computation date (SCD), which is the date of entry into federal civil service. Also provided in approximately two thirds of the cases were the individual's civil service grade at time of SCD and the individual's minority designator.

Comparison Groups. Data for both the bachelor's degree plus post-bachelor's degree work sample and the non-AFIT master's degree sample were also obtained from the HQ AFMC Civilian Personnel System database. The data included the same variables as those collected for the AFIT graduates.

Description of Specific Data Sets

Before going into the formal analysis of the data, a description is given of the four data sets: 1) total Air Force civilian AFIT graduates from the School of Logistics and Acquisition Management during the past 25 years (1968-92); 2) civilian AFIT graduates currently working for AFMC; 3) AFMC civilian administrative and professional personnel with bachelor's degrees and post-bachelor's degree work only; and 4) AFMC civilian and administrative personnel with master's degrees from institutions other than AFIT.

Air Force Civilian AFIT Graduates.

Total Number. There have been 246 Air Force civilian AFIT graduates from the School of Logistics and Acquisition Management for the past 25 years (1968-92). Figure 1, Total Number of Air Force Civilian AFIT Grads, shows the breakdown per 5-year time period. It is interesting to note that through 1971, only one 12-month program (four quarters) was provided at AFIT per year. Beginning in 1972, two 12-month classes were given per year, one beginning in January and the other in June. Beginning in 1982, the 12-month class gave way to the present 15-month

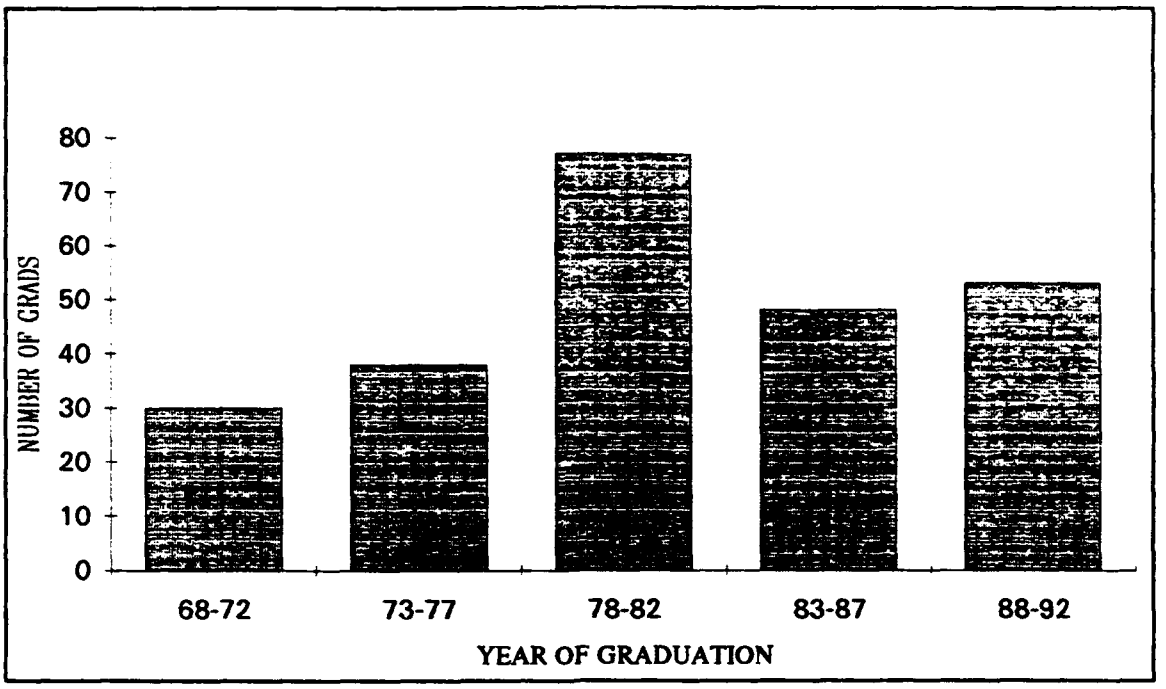

Figure 1. Total Number of Air Force Civilian AFIT Grads

program beginning in June, when the number of quarters was increased from four to five.

Major Command. The vast majority (216) of the 246 Air Force civilian AFIT graduates came from what is now AFMC. The former Air Force Logistics Command (AFLC) provided 181, with 35 coming from the former Air Force Systems Command (AFSC). Only 30 came from other commands or agencies, such as the former Strategic Air Command and Tactical Air Command, Air Training Command, Air Force Auditor General, et cetera. The major trend has been a decrease in the percentage of students from the former AFLC (current AFMC HQ and Air Logistics Centers) and an increase

in the percentage coming from the former AFSC (current AFMC Air Product Centers).

Areas of Specialization. As can be seen in Figure 2, Academic Specialization at AFIT - Total AF Civilian AFIT Grads, the main area of academic specialization at AFIT over the past 15 years has been in general Logistics, which was termed LOG until 1982 when it was changed to Graduate Logistics Management (GLM). (The period from 1968-77 was not included in Figure 2, since all but four people majored in LOG, with those four majoring in Procurement Management (PM) beginning in 1975.) In 1979 PM became Government Contracting and Acquisition (GC&A), which was changed in 1983 to Graduate Contracting Management (GCM) and Graduate

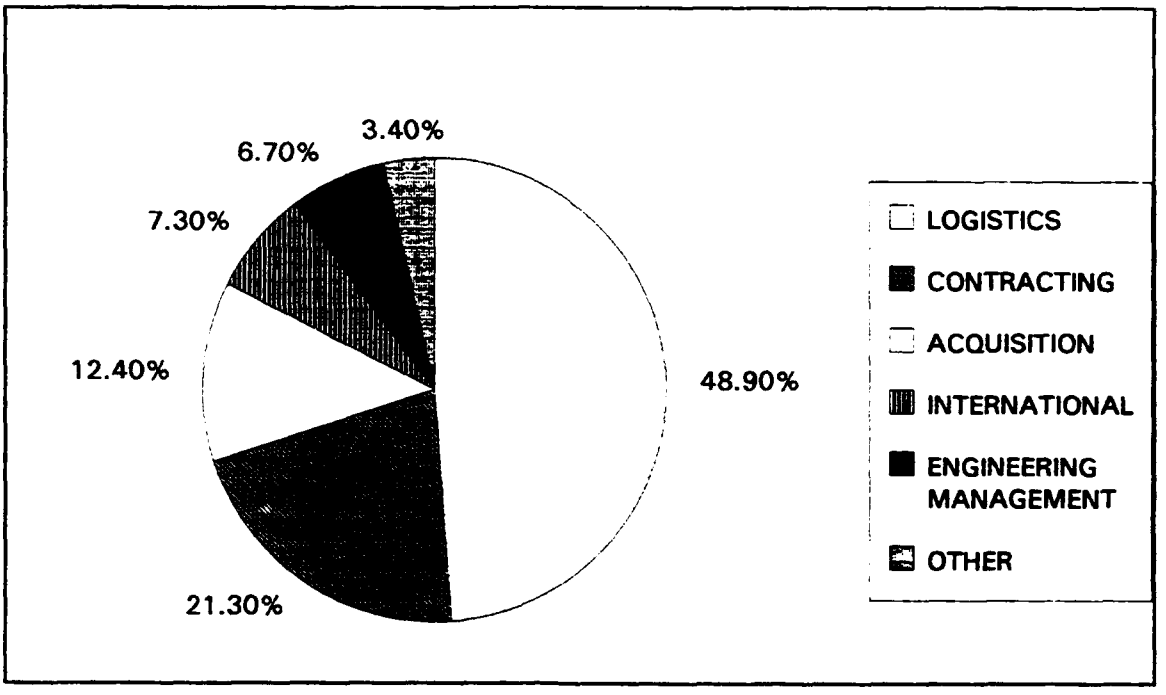

Figure 2. Academic Specialization at AFIT - Total AF Civilian AFIT Grads

Cost Analysis (GCA). Civilians majored in International Logistics only from 1978 through 1982. In 1992 the Graduate Engineering Management (GEM) specialty was transferred to AFIT's School of Engineering. The primary areas of concentration for civilians over the last two years (1991 and 1992) have been GLM and GCM with 10 civilians in each.

Male and Female. Of the 246 total Air Force civilian AFIT graduates, 192 (78.0%) were male and 54 (22.0%) were female. As can be seen in Figure 3, Male and Female - Total AF Civilian AFIT Grads, the proportion of males to females is getting smaller. Currently over one third of the civilian AFIT graduates are female.

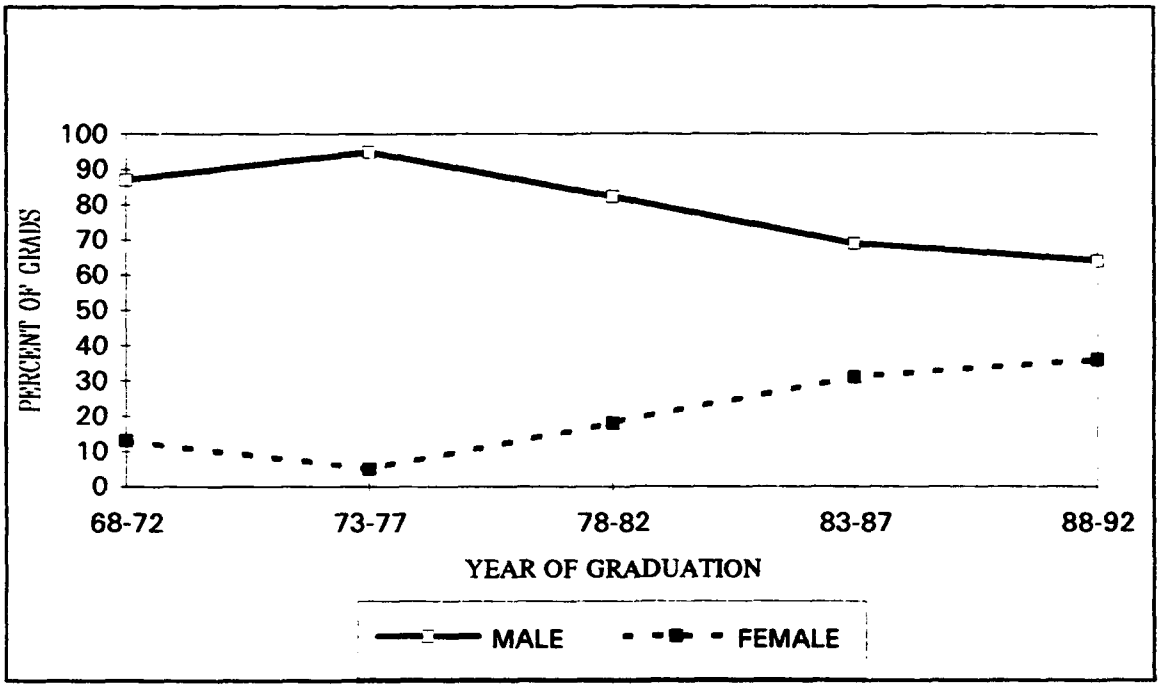

Figure 3. Male and Female - Total AF Civilian AFIT Grads

Grade at Graduation. The GS/GM grades at graduation ranged from 9 to 14, with the majority (53.1%) of the civilian AFIT graduates being 12s. The average grade at graduation was 12.0, with the graduates for all 5-year periods from 1968-92 except for one (1978-82) having an average grade of above 12.

Grade Point Average (GPA). The average GPA obtained at AFIT over the past 25 years was 3.55, with males averaging 3.52 and females 3.62. The average GPA has increased to above 3.6 over the last 10 years. When looking at 5-year periods from 1968-92, women have had a higher average GPA than men in all but the first period of 1968-72.

Civilian AFIT Graduates At AFMC.

Prior Academic Concentration. The areas of academic concentration prior to attending AFIT for the 141 civilian AFIT graduates at AFMC were split between 50 Business (36.5%) and 50 Technical (36.5%), with 37 Other (27%). In addition, there were three unknowns and one who had no prior degree. Business consisted primarily of business administration, although it was defined to include other disciplines such as economics, management, accounting, and finance. The technical category consisted primarily of various types of engineering with some math, physics, chemistry, et cetera. The "other" category contained a high concentration of liberal arts degrees. As can be seen in Figure 4, Prior Academic Concentration - AFIT Grads with

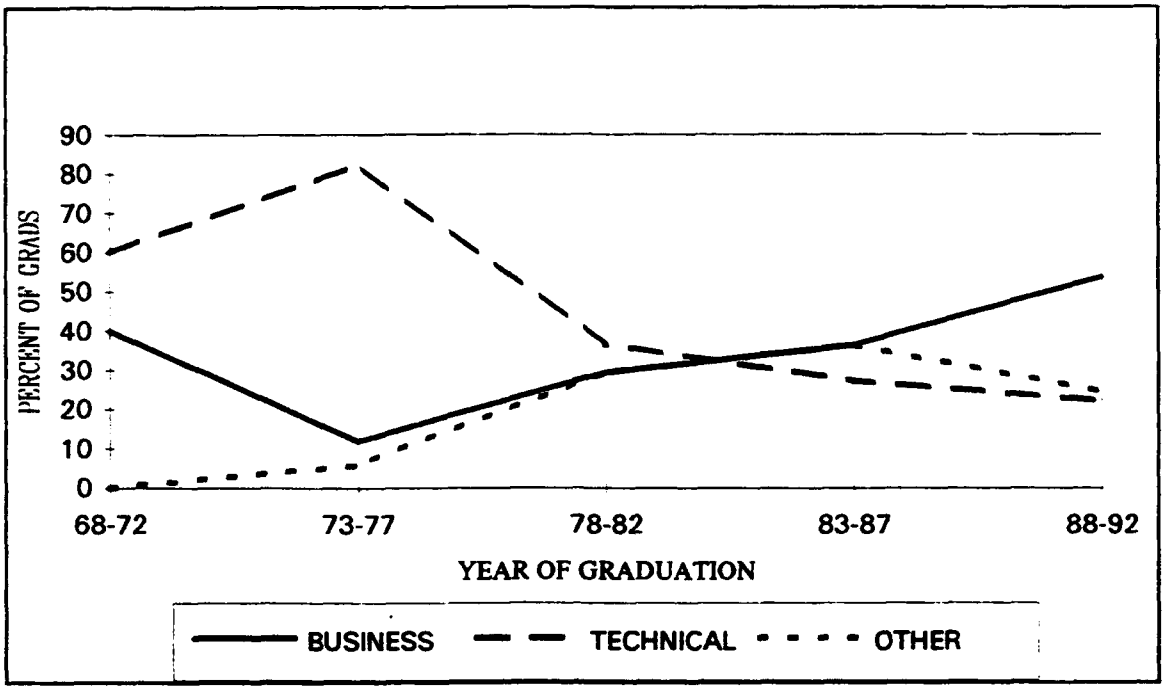

Figure 4. Prior Academic Concentration - AFIT Grads With AFMC

AFMC, the trend has been toward a very pronounced decrease in the percentage of students with a technical/engineering academic background and a corresponding increase in the percentage with a business background.

Male and Female. Of the 141 civilian AFIT graduates currently with AFMC, 108 (76.6%) were male and 33 (23.4%) were female. This compares to the male and female percentages for the total Air Force civilian AFIT graduates of 78.0% and 22.0%, respectively.

Minority Designation. The minority designation was only known for 95 of the 141 civilian AFIT graduates at AFMC. The vast majority (94.7%) were White, with 3.2% being Black, 1.1% Hispanic, and 1.1% Other.

Age at Graduation. The average age at graduation was 36.0 years old for civilian AFIT graduates at AFMC, who ranged from 27 to 47. The average age for males was 36.2 years and 35.2 for females. The average age of civilian AFIT graduates had been steadily increasing to where it was currently over 37 years old.

Grade at Graduation. The average grade at time of graduation was very close to that of the total Air Force civilian AFIT graduates. Grades also ranged from 9 to 14, with the majority of graduates (57.4%) being 12s. The average grade at graduation was 12.0, with males having a slightly lower average grade than females (12.0 and 12.1, respectively).

Grade Point Average (GPA). The GPA for the 141 civilian AFIT graduates at AFMC was 3.59, which was slightly higher than the average for the total Air Force civilian AFIT graduates (3.55). The average GPA for females was 3.65, which was again higher than for males (3.57). When dividing the GPAs into quartiles, Figure 5, Grade Point Average - AFIT Grads With AFMC, shows how many of the graduates fell into each group. It is interesting to note that 63.8% of the civilian AFIT graduates had GPAs of 3.5 and above versus only 36.2% with GPAs below 3.5.

Current Grade. The current grades for civilian AFIT graduates at AFMC ranged from one 11 to two 16s, who are part of the Senior Executive Service (SES). The greatest number of graduates (41.1%) were currently 13s.

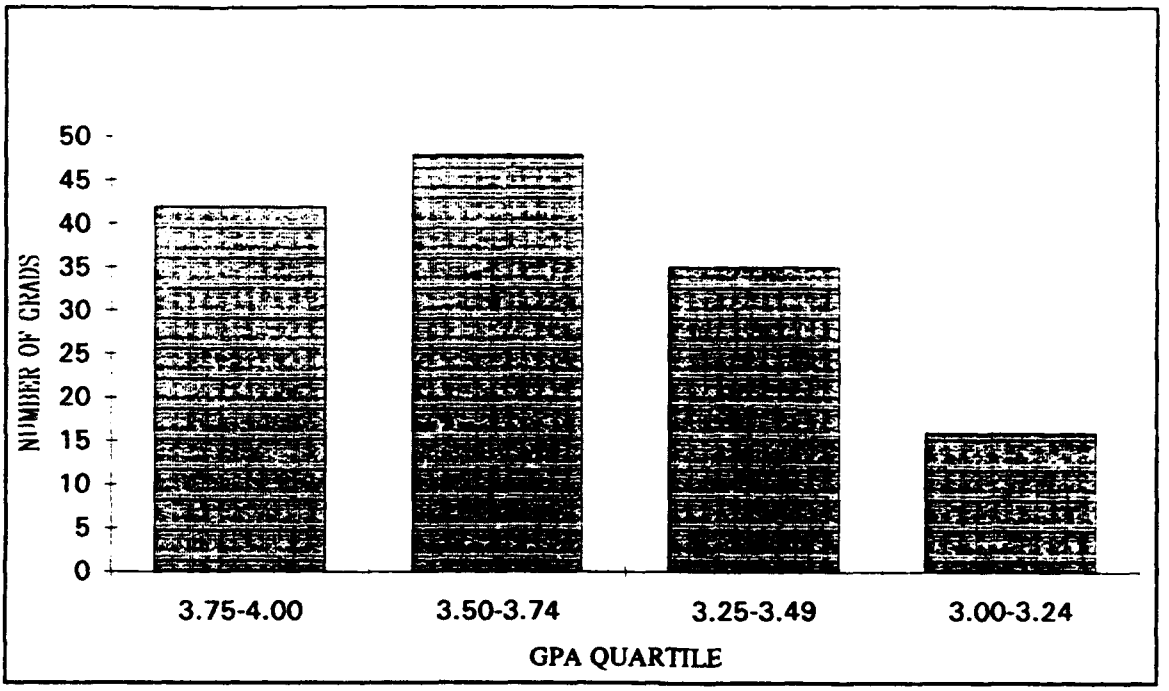

Figure 5. Grade Point Average - AFIT Grads With AFMC

The average current grade was 13.2, with males having a slightly higher average grade than females (13.2 and 13.1, respectively).

Current Grade By GPA. As can be seen in Figure 6, Current Grade By GPA - AFIT Grads With AFMC, the higher the GPA quartile, the higher the average current grade. AFIT graduates with GPAs in the top quartile of 3.75 and above had an average grade of 13.6, which is a full grade above the 12.6 average grade for those graduates with GPAs in the bottom quartile of under 3.25.

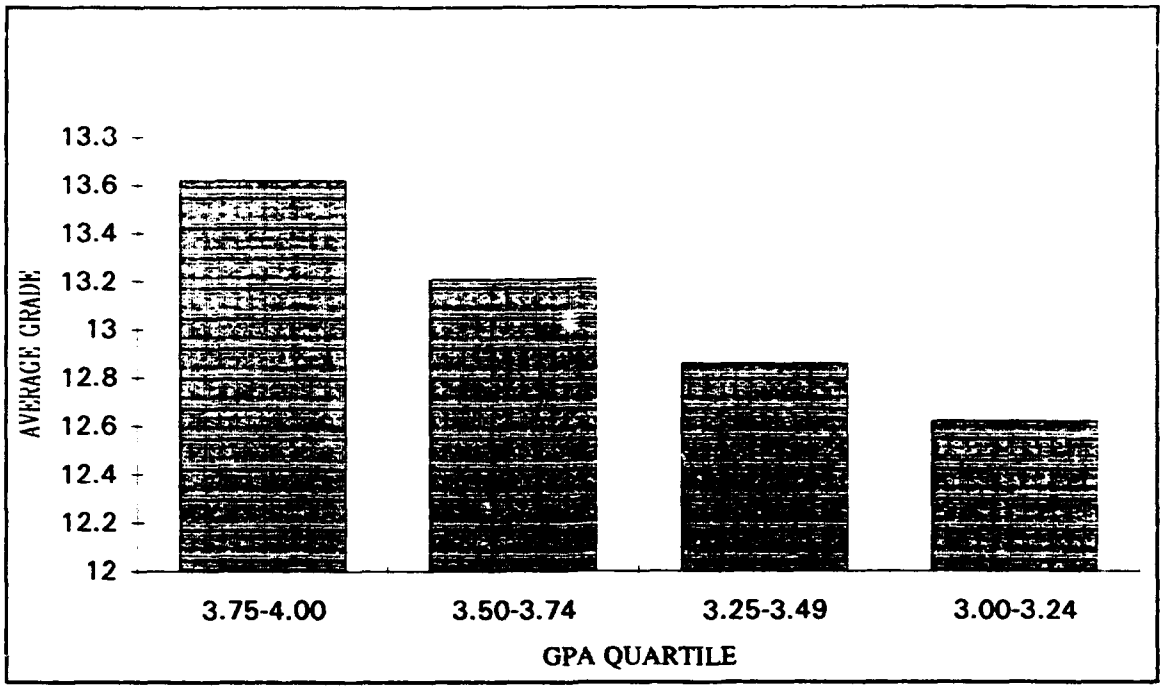

Figure 6. Current Grade By GPA - AFIT Grads With AFMC

Bachelors Comparison Group.

General. The random sample of 300 professional and administrative personnel with only bachelor's degrees who were currently working for AFMC was reduced in size to 254. Since there were no civilian AFIT graduates with a Service Computation Date (SCD - date of entry into federal civil service) later than 1986, 46 people in the Bachelors group with SCDs in the most recent five-year period (1988-92) were deleted.

Male and Female. Of the 254 people in the Bachelors group, 199 (78.3%) were male and 55 (21.7%) were female. This compares to the male and female percentages

for the 141 civilian AFIT graduates at AFMC of 76.6% and 23.4%, respectively.

Minority Designation. The Bachelors group had a higher percentage of minorities (18.5%) than the 5.3% for the 95 AFIT graduates for which the minority designation was known. The minorities for the Bachelors group consisted of 8.3% Black, 6.7% Hispanic, and 3.5% Other.

Age at Service Computation Date (SCD). The average age at time of entry into federal civil service was 28.0 years old for the Bachelors group, who ranged from 18 to 51. The average age for males was 28.3 and 27.0 for females. The ave ·ge age at SCD was less for AFIT graduates (25.2), who ranged from 18 to 41, with males and females averaging 25.6 and 24.2 years old, respectively.

Grade at SCD. Since GS 5 is considered the entry level grade in the administrative and professional series, only grades at SCD of GS 5 and above were recorded. The average entry grade was 6.0 for the 143 members of the Bachelors group for which the entry grade of GS 5 or above was known. Males had an average entry grade of 5.9 and females 6.4. This compared to the average of 6.9 for the 87 AFIT graduates for which the entry grade of GS 5 and above was known, with males averaging 7.1 and females 6.0. The highest entry grade in each of the groups was 12.

Current Grade. The current grades for the 254 graduates with bachelor's degrees ranged from 7 to 15, with almost half of them (47.2%) being 12s. The average current

grade was 11.9, which was less than the average grade at graduation for civilian AFIT graduates (12.0). The average current grade for the 199 Bachelors males was 12 1, whereas the average for females was almost a full grade lower (11.2). This is in contrast to the average current grades for the male and female AFIT graduates, which were much closer to each other (13.2 and 13.1, respectively).

Current Grade By SCD. Figure 7, Current Grade By SCD - Bachelors and AFIT Grads, shows the average current grade by time periods of entry into federal civil service for both the Bachelors and AFIT graduates. AFIT graduates had a higher average current grade for all of the SCD time periods.

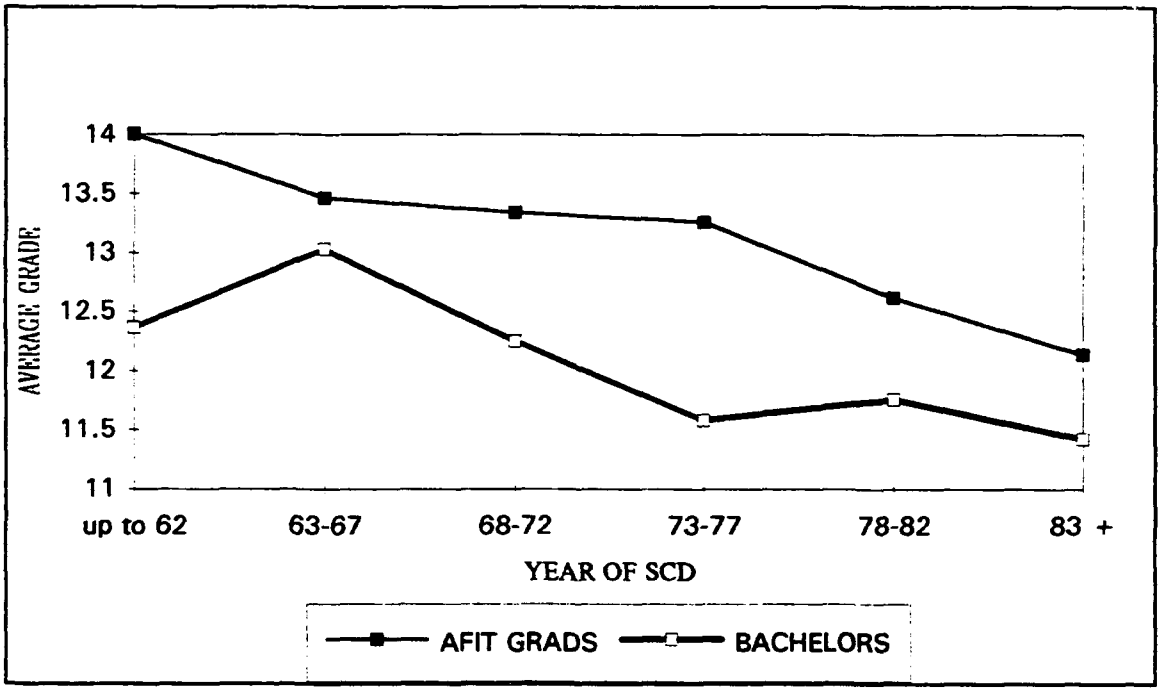

Figure 7. Current Grade By SCD - Bachelors and AFIT Grads

Current Years of Civil Service. The average current years of federal civil service for the Bachelors group was 17.0 years, with a range from 6 to 44 years. Males had 17.8 years of service and females 14.3 years. The average current years of service for AFIT graduates was over three years higher (20.4), with a range from 7 to 38. AFIT graduate males averaged 21.1 years of civil service and females 17.9 years.

Current Age. The average current age was 45.1 years old for the Bachelors group, who ranged from 25 to 75. Males averaged 46.1 years old and females 41.3. This was about one year less than for AFIT graduates, who averaged 45.9 years old, with a smaller range of from 31 to 63. AFIT graduate males and females averaged 47.0 and 42.1 years old, respectively.

Non-AFIT Masters Comparison Group.

General. The random sample of 300 administrative and professional personnel currently working for AFMC with master's degrees from institutions other than AFIT was reduced to 190. This was to eliminate those people who received their master's degree before they began to work for the Air Force, since all AFIT graduates receive their degree only after working for the Air Force for a period of time.

Male and Female. Of the 190 members of the Non-AFIT Masters group, 151 (79.5%) were male and 39 (20.5%) were female. Both the Bachelors and AFIT graduates had a larger percentage of females (21.7 and 23.4, respectively).

Minority Designation. The Non-AFIT Masters group had 16.8% minorities, which was closer to the percentage of minorities for the Bachelors sample (18.5%) than for the AFIT graduates (5.3%). Of the 32 Blacks in the three comparison groups, 9% had an AFIT master's degree, 25% had a non-AFIT master's degree, and 66% had only a bachelor's degree. Of the 32 Hispanics, 3% had an AFIT master's degree, 44% had a non-AFIT master's degree, and 53% had only a bachelor's degree. Of the 20 in the "other" category, 5% had an AFIT master's degree, 50% had a non-AFIT master's degree, and 45% had only a bachelor's degree. Of the 455 Whites, 20% had an AFIT master's degree, 35% had a non-AFIT master's degree, and 45% had only a bachelor's degree.

Grade at Graduation. Figure 8, Grade At Graduation - Non-AFIT Masters, shows the grade at graduation for the 187 of the 190 Non-AFIT Masters for which the grade at graduation was known. The average grade at graduation was 11.4, with the average grade for males being higher than for females (11.7 and 10.2, respectively). This compared to the average grade at graduation of 12.0 for AFIT graduates, with the average grade for AFIT males (12.0) being slightly less than for females (12.1).

Civil Service Time At Graduation. The average amount of federal civil service at the time of graduation for Non-AFIT Masters was 8.8 years, with a range from 1 to 31 years. The average for AFIT graduates was 10.6, with a range from 3 to 27 years. When looking at 5-year periods

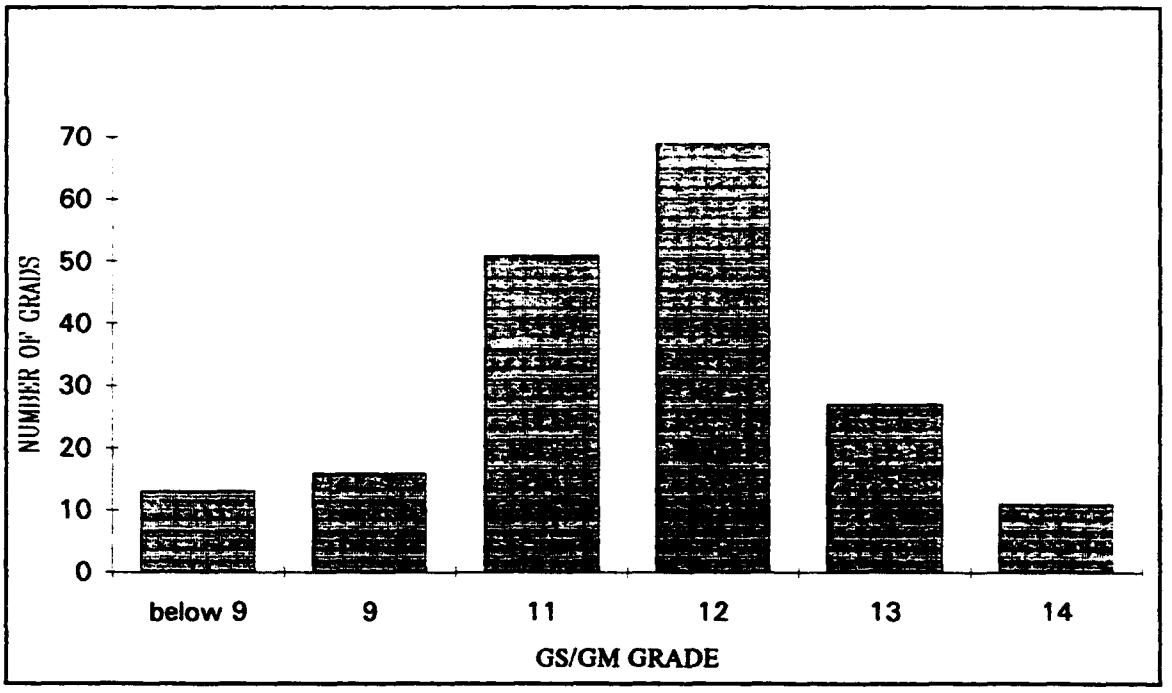

Figure 8. Grade at Graduation - Non-AFIT Masters

from 1968-92, the average amount of civil service time at graduation was higher for AFIT graduates for all five periods, with the difference being the largest (almost five years) for the most recent period of 1988-92.

Age at Graduation. The average age at graduation was 34.8 years old for Non-AFIT Masters, who ranged from 23 to 54. This compared to an average age of 36.0 for AFIT graduates, who ranged from 27 to 47. The average age at graduation for Non-AFIT Masters males was 35.0, which was less than one year older than for females (34.2). The average age at graduation for AFIT graduate males and females was 36.2 and 35.2, respectively.

Age at Service Computation Date (SCD). The average age at time of entry into federal civil service was 26.2 years old for Non-AFIT Masters, who ranged from 18 to 53. This was older than the average age at SCD for AFIT graduates (25.3 years) and younger than for the Bachelors group (28.0). The average age at entry for Non-AFIT males was 26.5, which was 1.8 years older than for females (24.7). The average ages at SCD for Bachelors and AFIT graduates males were also higher than for females by 1.3 and 1.4 years, respectively.

Grade at SCD. The average grade at time of entry into federal civil service was 6.9 for the 103 Non-AFIT Masters for which the entry grade of GS 5 or above was known. The average grade was 7.1 for males and 6.1 for females. This was virtually the same as the average entry grades for AFIT graduates (6.9 overall, 7.1 for males, and 6.0 for females), and higher than for the Bachelors group with the exception of the females (6.0 overall, 5.9 for males, and 6.4 for females).

Current Grade. The current grades for the Non-AFIT Masters ranged from four 9s to two 16s (SES). The average current grade was 12.7, which was about half of a grade below that of AFIT graduates (13.2). The average grade for Non-AFIT Masters males was 12.9, which was one grade higher than for females (11.9). This was similar to the difference found between the average current grades of Bachelors males and females (12.1 and 11.2, respectively).

Again, the average current grades of AFIT graduate males and females were much closer to each other (13.2 and 13.1, respectively).

Current Grade by SCD. Looking at the average current grade of Non-AFIT Masters divided into the same time periods of entry into federal civil service previously used in comparing the Bachelors and AFIT graduate samples (reference Figure 7), the Non-AFIT Masters fell between the two other groups. Looking at those who entered civil service in the earlier time period of 1963-67, the average current grade of Non-AFIT Masters was almost identical to that of the Bachelors group; however, in the more recent SCD time periods, it was closer to the average current grades of the AFIT graduates.

Current Grade By Year of Graduation. The current grade for Non-AFIT Masters in relation to AFIT graduates for 5-year time periods by year of graduation is shown in Figure 9, Current Grade By Year of Graduation - Non-AFIT Masters and AFIT Grads. As can be seen, the average current grades for AFIT graduates were at least .45 of a grade higher for all of the time periods, with the exception of the earliest period (1968-72) when the grades were virtually the same.

Current Age. The average current age was 45.2 years old for Non-AFIT Masters, who ranged from 24 to 66. This is close to the average current ages for both the Bachelors and AFIT graduates (45.1 and 45.9, respectively). The average age for Non-AFIT Masters males was 46.1, which

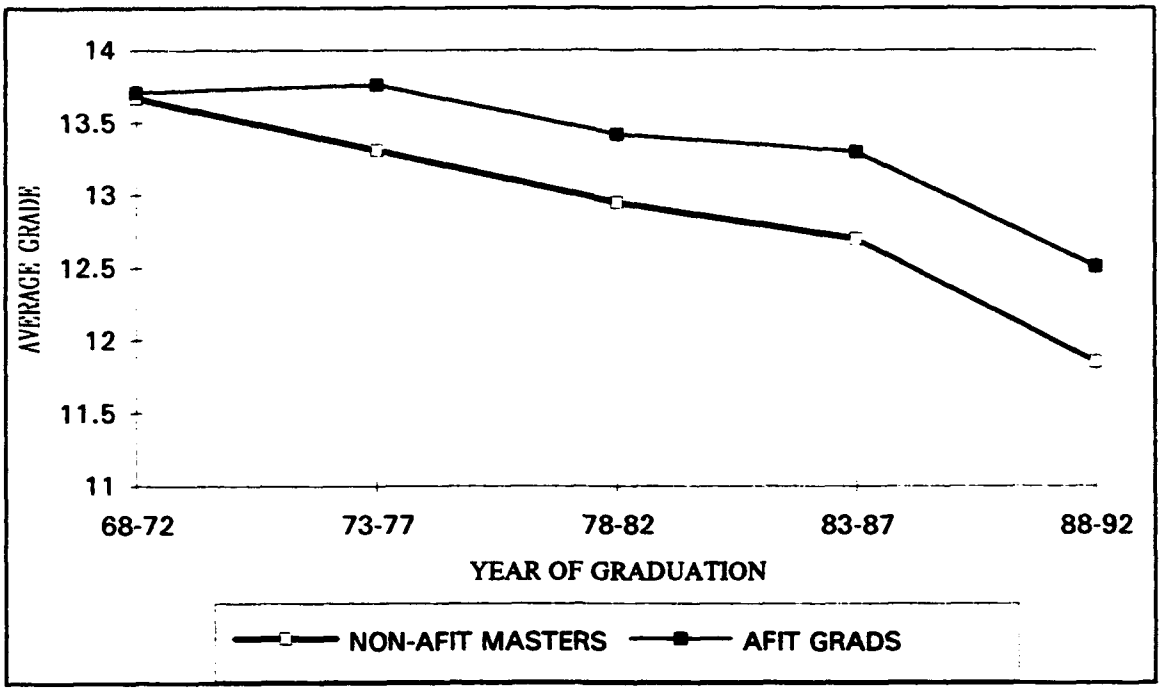

Figure 9. Current Grade By Year of Graduation - Non-AFIT Masters and AFIT Grads

was 4.5 years older than for females (41.6 years old). This was similar to the differences found for the Bachelors and AFIT Masters graduates, with males being 4.8 and 4.9 years older, respectively, than females. Figure 10, Current Age - All Three Comparison Groups, shows the breakdown of current ages. As can be seen, the majority of AFIT graduates are currently in their forties.

Current Years of Civil Service. The average current years of federal civil service for the Non-AFIT Masters group was 19.1, with a range from 3 to 43 years. This was less than the average service time of 20.4 years for AFIT graduates, but more than for the Bachelors group (17.0 years). The average civil service time for males was

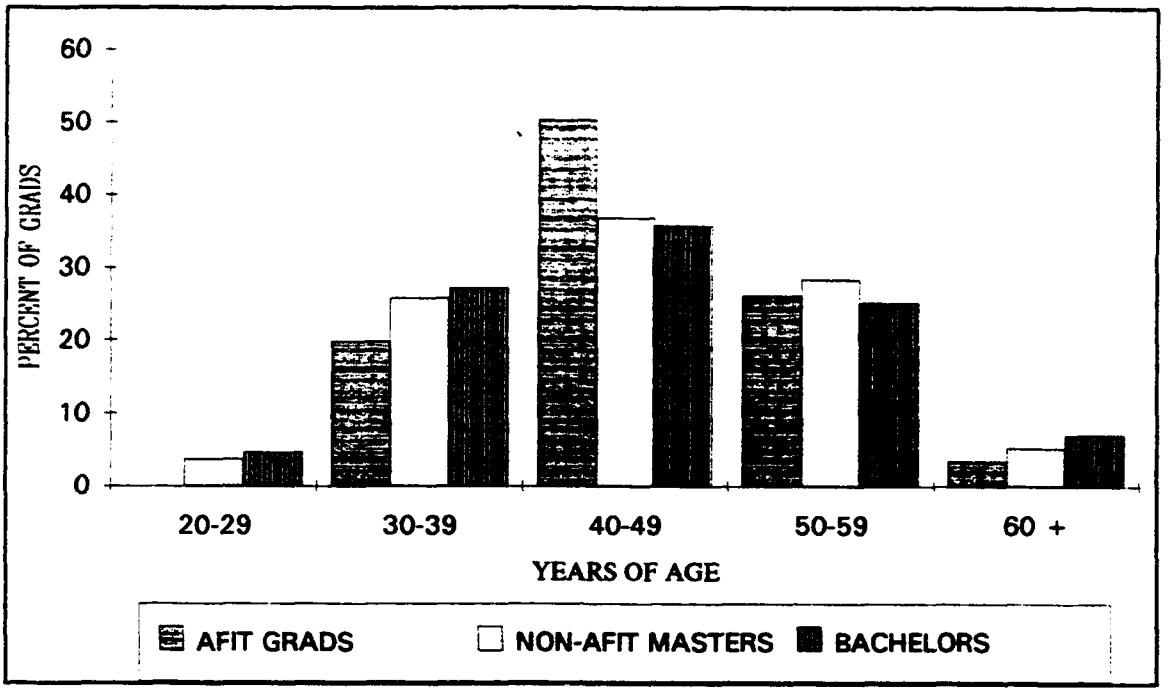

Figure 10. Current Age - All Three Comparison Groups

19.6 years, which was 2.8 years more than for females (16.8 years). Bachelors and AFIT graduate males also had more service time than females (3.5 and 3.2 years, respectively). Figure 11, Current Civil Service Time - All Three Comparison Groups, shows the breakdown of current years of civil service. As can be seen, AFIT graduates had the lowest percentage of members with both the fewest years of federal service (0 to 9) as well as the most years (30 or more), and the highest percentage with 10 to 29 years of federal civil service.

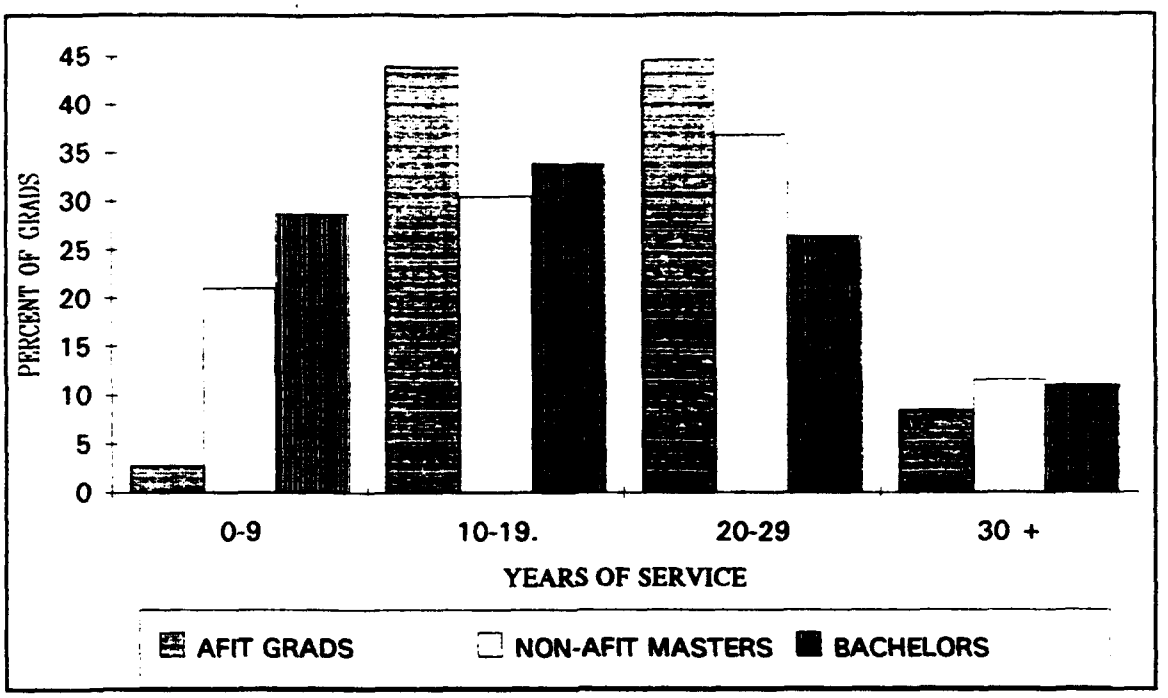

Figure 11. Current Civil Service Time - All Three Comparison Groups

Summary

This chapter presented a detailed description of the total Air Force civilian AFIT graduates from the School of Logistics and Acquisition Management, as well as of the three samples which are compared and analyzed in this study: the 141 civilian AFIT graduates currently with AFMC; the 190 AFMC civilians with a non-AFIT master's degree; and the 254 AFMC civilians with only a bachelor's degree.

Our research revealed that over the last 25 years, there has been an average of about 10 civilian AFIT graduates per year from the School of Logistics and Acquisition Management. The vast majority came from HQ AFMC and the Air Logistics Centers; however, the percentage

coming from the Air Product Centers has been increasing. Over 75% of the civilian AFIT graduates were male, but the percentage of females has been increasing. The majority of civilian AFIT graduate students had a grade level of GS12. About half of the students majored in Logistics Management, with Contract Management being the second most popular area of concentration. The average GPA was about 3.6, with females averaging about .1 point higher than the males.

Looking at the 141 civilian AFIT graduates currently working for AFMC, we found that the academic concentration prior to attending AFIT was primarily business or technical (mainly engineering), with about half currently coming from a business background. The age at graduation had been increasing and was presently over 37 years old. About 95% of the civilian AFIT graduates were white, with about 3% being black. Average current grades for male and female AFIT graduates were 13.2 and 13.1, respectively, with AFIT GPA being positively related to current grade level.

For the 190 Non-AFIT Masters and 254 Bachelors, both groups had a higher percentage of minorities than the AFIT graduates. Both groups were older when entering federal civil service and had less current years of civil service, on average, than AFIT graduates. Both groups had a lower average current grade for males and especially for females (Bachelors: 12.1 and 11.2, respectively; and Non-AFIT Masters: 12.9 and 11.9, respectively). The next chapter, Chapter IV, presents the results of our analysis.

IV. Findings and Analysis

T-Test

A t-test was performed on the sample of AFIT graduates and the sample of graduates with master's degrees from civilian institutions to determine if a significant difference exists between the two groups' mean current grades. The results showed a significant difference at the one percent level between the mean grade of 13.17 for the AFIT group and the mean grade of 12.69 for the civilian institutions group.

Regression Analysis

General. To investigate the difference in mean grades, multiple regression analysis was used to test the hypothesis that civilian graduates of AFIT's School of Logistics and Acquisition Management were promoted at a faster rate than civilians without AFIT graduate degrees. Multiple regression can control for the effects of other variables, such as years of service, beginning grade, et cetera, which may have an impact on the number of promotions received. Statistical Analysis Software (SAS) was used to estimate multiple regression equations which predict the number of promotions for various combinations of the following groups: civilians with AFIT master's degrees (AFIT Masters); civilians with master's degrees from civilian institutions

(Civilian Masters); and civilians with undergraduate degrees but no graduate degrees (Bachelors).

Analysis #1. The results reported in Table 1, Results of Regression Analysis #1, represent all three groups. The dependent variable in Table 1 is the number of promotions an individual has received since starting his or her career in federal civil service. A promotion is defined as one grade change on the General Schedule (GS) pay plan. The number of promotions received is defined as the difference between the current grade and the starting grade.

Both BEGINNING AGE and BEGINNING GRADE have a significant effect on the number of promotion steps. They are significant at the one percent level. The negative coefficients indicate that the older employees are at the start of their careers and/or the higher their starting grade, the fewer promotions they receive. This relationship between starting grade and promotions is expected, since there are proportionately fewer positions available at the higher grades. However, it is not clear why, with everything else the same, employees who are older at the beginning of their careers receive fewer promotions.

YEARS OF SERVICE has a significant effect (at the one percent level) on the number of promotions. The more years of service an employee has, the more promotions he or she receives. YEARS OF SERVICE SQUARED is significant at the five percent level. The negative coefficient of this variable indicates that while more years of service results

Table 1. Results of Regression Analysis #1

AFIT Masters, Civilian Masters and Bachelors Groups

Dependent Variable = Number of Promotion Steps Since Joining Federal Service

Variable	Coefficient	T-ratio	Mean
INTERCEPT	10.955	25.11	
BEGINNING AGE	-.035	-3.81***	26.76
BEGINNING GRADE	-.851	-32.52***	6.98
YEARS OF SERVICE	.118	3.54***	18.55
YEARS OF SERVICE^2	-.002	-2.32**	415.62
YEARS SINCE MASTERS	.024	1.72	5.69
FEMALE	.046	.30	.21
BLACK	.016	.05	.05
OTHER RACES	-.046	-.32	.17
AFIT MASTERS	.429	2.17**	.23
NON-AFIT MASTERS	.177	.94	.32

*** p=.01
** p=.05
* p=.10

Adjusted R^2 = .82

Sample size = 313

in more promotions, the number of promotions increases at a declining rate. YEARS SINCE MASTERS is the number of years since an employee has received a graduate degree. YEARS SINCE MASTERS has no significant effect on the number of promotions in this equation.

FEMALE is an indicator variable for sex.[1] BLACK and OTHER RACES are indicator variables for race. BLACK represents employees of the black race and OTHER RACES represents employees of all races other than white and black. FEMALE, BLACK and OTHER RACES have no significant effect on the number of promotions.[2]

AFIT MASTERS is an indicator variable representing employees with AFIT graduate degrees. NON-AFIT MASTERS is an indicator variable representing employees with graduate degrees from civilian institutions. An AFIT master's degree has a positive and significant effect on the number of promotions. The coefficient of this variable is significant at the five percent level and its positive coefficient indicates that AFIT graduates receive more promotions on average (approximately one-half of a grade). On the other hand, the results indicate that a master's degree from a civilian institution (NON-AFIT MASTERS) has no significant effect on the number of promotions.

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[1]Indicator (or "dummy") variables have a value of one if a given characteristic or situation is present and a value of zero otherwise.

[2]The sample includes 87 from the AFIT Masters group, 93 from the Civilian Masters, and 126 from the Bachelors group.

Analysis #2. The results reported in Table 2, Results of Regression Analysis #2, represent only the Civilian Masters group. The dependent variable is the number of promotion steps an individual has received since earning a graduate degree. AGE-AT-MASTERS has no significant effect on the number of promotions received. GRADE-AT-MASTERS is significant at the one percent level and has a negative effect on the number of promotions. The higher the grade at which the master's degree is earned, the fewer future promotions received.

YEARS SINCE MASTERS is significant at the one percent level and has a positive effect on the number of promotions received since earning a graduate degree. The more years since receiving a master's degree, the more promotions an employee receives. YEARS SINCE MASTERS SQUARED is also significant at the one percent level; the negative coefficient for the variable indicates the number of promotions increases at a decreasing rate as YEARS SINCE MASTERS increases. The variables FEMALE, BLACK, and OTHER RACES are not significant to the number of promotions.

Analysis #3. The results reported in Table 3, Results of Regression Analysis #3, represent only the AFIT Masters group. The dependent variable is the number of promotion steps an individual receives since earning a graduate degree. The variable AGE-AT-MASTERS has no significant effect on the number of promotions. GRADE-AT-MASTERS is significant at the one percent level and has a negative

Table 2. Results of Regression Analysis #2

Civilian Masters Group

Dependent Variable = Number of Promotion Steps Since Earning Graduate Degree

Variable	Coefficient	T-ratio	Mean
INTERCEPT	9.885	14.09	
AGE-AT-MASTERS	-.012	-.96	34.85
GRADE-AT-MASTERS	-.806	-19.87***	11.09
YEARS SINCE MASTERS	.169	4.20***	10.19
YEARS SINCE MASTERS^2	-.004	-2.53***	146.17
FEMALE	-.107	-.40	.20
BLACK	-.472	-.72	.04
OTHER RACES	-.153	-.58	.13

*** p=.01
** p=.05
* p=.10

Adjusted R^2 = .82 Sample Size = 98

Table 3. Results of Regression Analysis #3

AFIT Masters Group

Dependent Variable = Number of Promotion Steps Since Earning Graduate Degree

Variable	Coefficient	T-ratio	Mean
INTERCEPT	5.813	3.11	
AGE-AT-MASTERS	.007	.39	35.94
GRADE-AT-MASTERS	-.963	-15.23***	11.92
YEARS SINCE MASTERS	.156	2.76***	9.86
YEARS SINCE MASTERS^2	-.004	-1.75	134.39
FEMALE	.163	.64	.24
BLACK	1.240	2.00**	.02
OTHER RACES	-.141	-.69	.34
GPA	1.562	3.82***	3.58

*** p=.01
** p=.05
* p=.10

Adjusted R^2 = .77 Sample Size = 87

effect on number of promotions. The higher the civil service grade when the AFIT degree is earned, the fewer future promotions received. YEARS SINCE MASTERS is significant at the one percent level and has a positive effect on the number of promotions received since earning the degree. As expected, the more years since receiving an AFIT master's degree, the more promotions an employee receives. YEARS SINCE MASTERS SQUARED has no significant impact on number of promotions.

FEMALE has no significant effect on the number of promotions. BLACK has a coefficient which is significant at the five percent level and has a positive effect on the number of promotions. However, it should be noted that there are only three black graduates included in the AFIT Masters group. OTHER RACES does not significantly affect the number of promotions. GPA is the grade point average earned in an AFIT graduate program. GPA is significant at the one percent level. The positive coefficient of this variable indicates that the higher the GPA, the more promotions received since earning the degree.

Analysis #4. The results reported in Table 4, Results of Regression Analysis #4, represent both the AFIT Masters and Civilian Masters groups. Again, the dependent variable is the number of promotion steps an individual has received since earning a graduate degree. AGE-AT-MASTERS is significant at the five percent level and GRADE-AT-MASTERS is significant at the one percent level. The negative

Table 4. Results of Regression Analysis #4

AFIT Masters and Civilian Masters Groups

Dependent Variable = Number of Promotion Steps Since Earning Graduate Degree

Variable	Coefficient	T-ratio	Mean
INTERCEPT	10.108	22.39	
AGE-AT-MASTERS	-.019	-2.27**	35.31
GRADE-AT-MASTERS	-.793	-30.15***	11.44
YEARS SINCE MASTERS	.131	4.92***	10.05
YEARS SINCE MASTERS^2	-.002	-2.00**	141.18
FEMALE	-.156	-1.15	.21
BLACK	-.068	-.23	.03
OTHER RACES	-.176	-1.30	.22
AFIT MASTERS	.413	3.66***	.42

*** p=.01
** p=.05
* p=.10

Adjusted R^2 = .76 Sample Size = 328

coefficient for AGE-AT-MASTERS indicates that the older the employee is when receiving a master's degree, the fewer number of promotions are received. The negative coefficient for GRADE-AT-MASTERS indicates that the higher the employee's grade is when receiving a master's degree, the fewer number of promotions are received.

YEARS SINCE MASTERS is the number of years since receiving a graduate degree. It is significant at the one percent level and has a positive effect on the number of promotions received since earning a graduate degree. The more years since receiving a master's degree, the more promotions an employee receives. YEARS SINCE MASTERS SQUARED is significant at the five percent level and, again, its negative coefficient indicates that the number of promotions increases at a decreasing rate as YEARS SINCE MASTERS increases. An F test of the hypothesis that the coefficients of YEARS SINCE MASTERS and YEARS SINCE MASTERS SQUARED are separately and jointly equal to zero is rejected at the one percent level of significance.

AFIT MASTERS, an indicator variable representing employees with AFIT graduate degrees, is significant at the one percent level and has a positive effect on the number of promotions. On average, an AFIT master's degree increases the number of promotions received, everything else the same, by approximately one-half of a grade. The variables FEMALE, BLACK, and OTHER RACES do not significantly affect the number of promotions in this equation.

Analysis #5. The results reported in Table 5, Results of Regression Analysis #5, again represent both the AFIT Masters and Civilian Masters groups. The dependent variable is the number of promotion steps an individual has received since earning a master's degree. AGE-AT-MASTERS is significant at the five percent level and GRADE-AT-MASTERS is significant at the one percent level. As before, both AGE-AT-MASTERS and GRADE-AT-MASTERS have a negative effect on the number of promotions an individual receives.

YEARS SINCE MASTERS is significant at the one percent level and has a positive effect on the number of promotions received since earning a graduate degree. The more years since receiving a master's degree, the more promotions an employee receives. YEARS SINCE MASTERS SQUARED has no significant effect on the number of promotions. An F test of the hypothesis that the coefficients of YEARS SINCE MASTERS and YEARS SINCE MASTERS SQUARED are separately and together equal to zero is rejected at the one percent level of significance.

YEARS SINCE AFIT and YEARS SINCE AFIT SQUARED are interaction variables representing the product of AFIT multiplied times YEARS SINCE MASTERS and AFIT multiplied times YEARS SINCE MASTERS SQUARED. AFIT is an indicator variable which identifies an employee as an AFIT graduate. Both YEARS SINCE AFIT and YEARS SINCE AFIT SQUARED are significant at the one percent level. The positive coefficient for YEARS SINCE AFIT indicates an AFIT degree

Table 5. Results of Regression Analysis #5

AFIT Masters and Civilian Masters Groups

Dependent Variable = Number of Promotion Steps Since Earning Graduate Degree

Variable	Coefficient	T-ratio	Mean
INTERCEPT	10.118	22.16	
AGE-AT-MASTERS	-.018	-2.14**	35.31
GRADE-AT-MASTERS	-.785	-30.02***	11.44
YEARS SINCE MASTERS	.101	3.59***	10.05
YEARS SINCE MASTERS^2	-.001	-.70	141.18
YEARS SINCE AFIT	.103	3.42***	4.17
YEARS SINCE AFIT^2	-.005	-2.86***	56.90
FEMALE	-.149	-1.10	.21
BLACK	-.083	-.28	.03
OTHER RACES	-.159	-1.15	.22

*** p=.01
** p=.05
* p=.10

Adjusted R^2 = .76 Sample Size = 328

increases the number of promotions as the years since receiving the degree increases. However, the negative coefficient for YEARS SINCE AFIT SQUARED indicates the number of promotions increases at a decreasing rate as YEARS SINCE AFIT increases. An F test of the coefficients of YEARS SINCE AFIT and YEARS SINCE AFIT SQUARED shows results which are significant at the one percent level. The variables FEMALE, BLACK, and OTHER RACES are not significant to the number of promotions in this equation.

Analysis #6. The results reported in Table 6, Results of Regression Analysis #6, are for a sample which includes both the AFIT Masters and Civilian Masters groups. The dependent variable is the number of promotion steps an individual receives since earning a graduate degree. Both AGE-AT-MASTERS and GRADE-AT-MASTERS are significant at the one percent level, as expected, and have a negative effect on the number of promotions an individual receives. YEARS SINCE MASTERS is significant at the one percent level and has a positive effect on the number of promotions received since earning a graduate degree. The more years since receiving a master's degree, the more promotions an employee receives. YEARS SINCE MASTERS SQUARED is not significant in this equation.

It is interesting to note that the indicator variable FEMALE is significant at the five percent level and its coefficient implies a negative effect on the number of promotions. Everything else the same, women who earn a

Table 6. Results of Regression Analysis #6

AFIT Masters and Civilian Masters Groups

Dependent Variable = Number of Promotion Steps Since Earning Graduate Degree

Variable	Coefficient	T-ratio	Mean
INTERCEPT	10.290	22.30	
AGE-AT-MASTERS	-.026	-2.67***	35.31
GRADE-AT-MASTERS	-.789	-28.53***	11.44
YEARS SINCE MASTERS	.136	4.09***	10.05
YEARS SINCE MASTERS^2	-.002	-1.64*	141.18
FEMALE	-.418	-2.36**	.21
BLACK	-.319	-.92	.03
OTHER RACES	-.085	-.40	.22
AFIT AGE-AT-MASTERS	.029	1.92*	15.12
AFIT GRADE-AT-MASTERS	-.064	-1.33	5.04
YEARS SINCE AFIT	.012	.22	4.17
YEARS SINCE AFIT^2	-.001	-.47	56.90
AFIT FEMALE	.667	2.48**	.10
AFIT BLACK	1.158	1.77*	.01
AFIT OTHER RACES	-.093	-.34	.14

*** p=.01
** p=.05
* p=.10

Adjusted R^2 = .77 Sample Size = 328

master's degree from a civilian school receive one-half of a grade fewer promotions on average.[3] The coefficients of the variables BLACK and OTHER RACES are insignificant.

The remaining seven variables are interaction variables used to determine if the impact of the same characteristics on the number of promotions differs between AFIT Masters and Civilian Masters graduates. No significant differences are found for AGE-AT-MASTERS, GRADE-AT-MASTERS, YEARS SINCE MASTERS, YEARS SINCE MASTERS SQUARED, BLACK, and OTHER RACES. However, AFIT FEMALE (AFIT multiplied times FEMALE) is significant at the five percent level and has a positive effect on the number of promotions. While the indicator variable FEMALE indicates that being a female of a civilian graduate program decreases the number of promotions, AFIT FEMALE indicates that being a female with an AFIT graduate degree increases the number of promotions relative to being a female with a master's degree from some other institution. The combined effect of these two variables together is approximately zero for AFIT female graduates and, therefore, the equation suggests that gender is not a determinant of the number of promotions they receive. The remaining interaction variables, AFIT BLACK and AFIT OTHER RACES, have no significant effect on the number of promotions. AFIT BLACK is the product of AFIT multiplied times BLACK; AFIT OTHER RACES is AFIT multiplied times OTHER RACES.

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[3]Females represent 20.5% of the Civilian Masters group.

V. Conclusions and Recommendations

Review of Research Hypotheses

This study investigated the possibility that the civilian graduates of AFIT's School of Logistics and Acquisition Management (formerly School of Systems and Logistics) are promoted at a faster rate than civilians without AFIT graduate degrees. The average current grade of an AFIT graduate was found to be higher than the average current grade of a graduate with a master's degree from a civilian institution. Results from multiple regression analysis indicate that, everything else the same, employees with AFIT master's degrees are promoted at a faster rate than employees with master's degrees from civilian institutions.

Figure 12, Promotions Since Graduation - Non-AFIT Masters and AFIT Grads, which is a graph of the multiple regression equation shown in Table 5, Results of Regression Analysis #5, shows the projected number of promotions for AFIT graduates as compared to the projected number of promotions for graduates of master's degree programs at civilian institutions. Average values were used for each of the variables in the equation to project the number of promotions expected each year after receiving a master's degree.

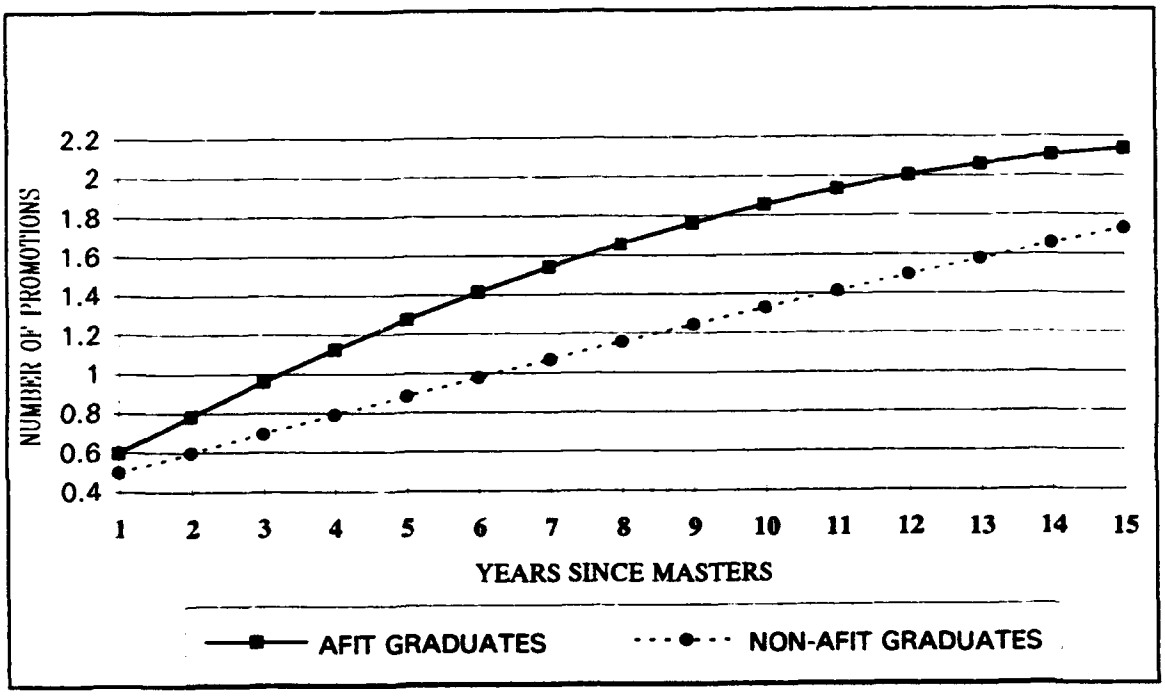

Figure 12. Promotions Since Graduation - Non-AFIT Master and AFIT Grads

Figure 13, Promotions Since Graduation By GPA - AFIT Grads, which is a graph of the multiple regression equation shown in Table 3, Results of Regression Analysis #3, shows the projected number of promotions for AFIT graduates with grade point averages (GPAs) in the upper quartile as compared to a comparable number of AFIT graduates with GPAs at the lower end of the GPA range.[1] GPAs in the upper quartile were from 3.75 to 4.0; and GPAs at the lower end ranged from 3.0 to 3.36. The graph includes GPA data from the 246 Air Force civilian AFIT graduates, as collected from the AFIT Registrar's office. The graph indicates that

[1]Figure 2 uses simple average values for all variables other than those related to time since graduation.

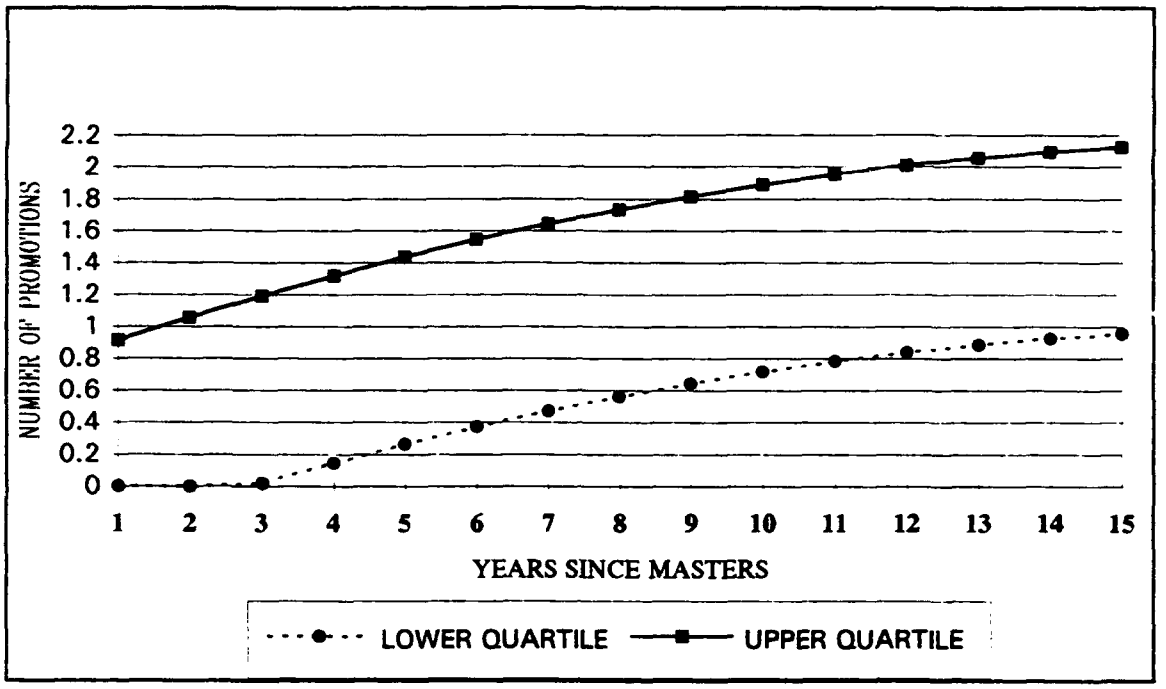

Figure 13. Promotions Since Graduation By GPA - AFIT Grads

graduates with GPAs in the upper quartile receive more promotions during the years after receiving their master's degree than a comparable number of AFIT graduates with GPAs at the lower end of the GPA range.

Recommendations

General. Multiple regression analysis indicated that females with master's degrees from civilian institutions received fewer promotions than males with master's degrees from civilian institutions (Table 6, Results of Regression Analysis #6). It is recommended that a study be conducted to determine why these females receive fewer promotions.

This study also showed that AFIT GPAs had an affect on the number of promotions received by AFIT graduates. It is

recommended that research be conducted to determine if GPAs earned in bachelor's and master's degree programs in civilian institutions have an affect on the graduates' future rate of promotion.

Finally, this study analyzed the promotion rate of a sample of civilians who had completed their AFIT graduate education on a full-time basis. The sample of civilians in the Non-AFIT Masters group included only those graduates who obtained their degree after they began work in federal civil service. Thus, their graduate education would have been primarily on a part-time basis. It is recommended that research be conducted to compare the promotion rate of civilians who have completed their graduate education at a civilian institution on a full-time basis with the promotion rate of the full-time AFIT graduates.

Retention. In addition to comparing the promotion rate of civilian AFIT graduates with the promotion rate of graduates from other institutions, we had originally planned to compare the retention rate of AFIT graduates to our other samples. However, the database available from HQ AFMC included only those employees who had separated from the Air Force within the last five years. Also, it was not possible to identify those who quit the Air Force to pursue other job opportunities from those who retired from federal civil service.

It is our recommendation that further research be conducted into the attrition rate of civilian AFIT graduates

compared to other civilians. The significant statistic would appear to be how many "quit" the Air Force for other jobs in the civilian sector.

Conclusions

AFIT graduates are promoted at a faster rate than Non-AFIT graduates and, assuming promotions are based primarily on job performance, the Air Force is realizing a greater rate of return from employees with AFIT master's degrees. The specialized knowledge and skills acquired in AFIT's School of Logistics and Acquisition Management programs appear to enhance job performance. However, it is possible that AFIT graduates were high performers prior to completing AFIT's graduate programs and would have been promoted at a faster rate even without an AFIT degree. It is also possible that prior to attending AFIT, students who achieved higher GPAs performed jobs at a higher level of effort than students with lower GPAs and projected that higher level of effort toward their academic assignments.

Regardless of whether or not the AFIT civilian graduates possessed the attributes needed for career advancement prior to completing their AFIT graduate programs, their faster promotion rate shows that the Air Force is training employees who are capable of utilizing their graduate education to enhance their performance and thus the mission capabilities of the Air Force.

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Vita

Ms. Helena R. Hughley was born in Warren, Ohio on October 23, 1958, where she graduated from Western Reserve High School in 1976. She attended Kent State University, graduating with a Bachelors of Business Administration degree (Major: Business Management) in August, 1981. She began her Air Force career in 1985 as a trainee with the Air Force Logistics Command (AFLC) at Wright-Patterson Air Force Base, Ohio. After an orientation on logistics operations at AFLC headquarters, she was transferred to Tinker Air Force Base, Oklahoma, for an 18-month training program in field logistics operations. After completion of the program, she returned to AFLC headquarters in 1987, where she held the position of Management Analyst until her selection to attend the Graduate Logistics Management program at AFIT in 1992.

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13. ABSTRACT *(Maximum 200 words)*

This study analyzes the career progression rates of civilian graduates from the School of Logistics and Acquisition Management of the Air Force Institute of Technology (AFIT). The sample includes all civilian AFIT graduates who are currently working for the Air Force Materiel Command (AFMC). Actual promotion rates of the AFIT graduates are compared to promotion rates for two comparison groups: AFMC civilians with a master's degree from a civilian institution; and AFMC civilians with a bachelor's degree but no graduate degree. A regression analysis is performed to study the relationship between specific factors and a graduate's future rate of promotion. The results of this analysis show that civilian AFIT graduates have promotion rates that are significantly higher than either civilian comparison group. The AFIT graduate has a higher rate of promotion than a civilian with a non-AFIT master's degree of about one-half grade, on average. It was also found that the grade point average obtained while attending AFIT is significantly related to the future rate of promotion. Other results show that being a female is negatively related to rate of promotion except for the AFIT graduate female, where the relationship is positive.

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